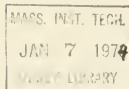






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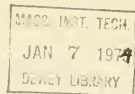
THE SETTING OF ALLOWED RATES OF RETURN
FOR PUBLIC UTILITIES

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Stavros B. Thomadakis

December 1973

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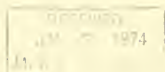
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THE SETTING OF ALLOWED RATES OF RETURN FOR PUBLIC UTILITIES

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Introduction

Regulation of public utilities usually involves the setting of maximum overall rates of return which the firms are allowed to earn. These rates are normally applied on some measure of the firm's "rate base" which is also determined by the regulators. Normally the "rate base" is some variant of the firm's book value.

Through court decisions general standards have developed as to the spirit of regulation. The return allowed must be sufficient to attract capital in the market. It must be commensurate to returns enjoyed by firms which face corresponding risks. (1). The meaning of these general notions to the economist is fairly clear. Returns allowed must somehow reflect the opportunity costs of capital. (2)

In actuality, two prevalent practices seem to characterize regulatory rates. On the one hand commissions deal in units of book value. They estimate the overall rate from accounting statements and apply it on the rate base. On the other hand, they tend to use as a standard for comparable earnings the book rates of return of similar firms, usually firms in the same line of business. There is no necessary systematic relationship between book and real rates of return across a sample of firms. (3)

The main criticism to regulatory rates thus derived is that they are backward looking, based on historical rather than future costs. Nevertheless these rates have forward-looking effects since they may lead to changes in the firm's future cash flows. Even if regulation is non-optimal in some sense, its departures from any optimal standards can be more clearly assessed if variables determining regulatory behavior can be discovered. This paper constitutes a first attempt along that line.

The explanatory approach to regulatory rates is separated in two parts, each making use of an internally consistent framework. The first part seeks to explain rates allowed on equity on the basis of market variables. Two separate hypotheses are tested. One formulates a simple correspondence between the allowed rate and the rate of return expected on equity as derived from the Capital Asset Pricing Model. The other uses the stock price level of a firm as a major hypothesized input to the rate decision.

The second part seeks to explain overall rates allowed on the basis of variables which appear in the accounting statements of the regulated firms. A version of the comparable earnings rule is formulated and tested. In actuality regulators may be using both sets of variables. Virtual lack of theory interrelating the two frameworks makes it difficult to formulate hypotheses in a "mixed" framework. Furthermore, the degree to which rates are explainable within each framework separately will constitute evidence as to its sufficiency.

The Data

The hypotheses are tested over a cross-sectional sample. The sample covers 196 regulatory decisions in the period 1959-1969. All kinds of public utilities are present: telephone, gas, electricity, and water. The number of firms in the sample is less than 196 since some of the decisions refer to the same firm at different points in time. The decisions are those made both by state and federal commissions. (4)

The rates available in the sample are overall rates of return. The rate bases fall in two broad categories: Book Cost (BC) of assets, and Fair Value (FV) of assets. On repeated runs through the sample rates allowed on FV bases appeared consistently lower than rates allowed on a BC base by an average factor of 0.42. This is reasonable since FV rate bases are known to be arrived at by making upward adjustments to book values.

Book cost bases usually exclude the book values of fixed assets in the process of construction. (5) Thus they are generally lower than the book value of a firm's long term capitalization. (6) FV bases, being upward adjustments of BC values may actually come closer to book values of long-term capital.

The level of the rate base is not always reported in the data available. The type of rate base is always known. The differential factor of 0.42 is used to adjust for rate base type, and subsequently, book values of long-term capital were used uniformly as a rate base proxy when necessary (7).

Part I : Allowed Rates and Market Variables

Regulatory rates are purported to make allowance for risk in order to enable the firm to attract capital in the market. This means that in a strict economic sense rates must reflect the opportunity costs of putting capital in a risky investment. The CAPM is a framework within which equilibrium risk-premia can be derived. Despite its restrictive assumptions, it can be used to clarify some points about regulatory intervention.

Let us first consider regulatory rates as marginal return on new investments. Take an investment project which will cost I dollars, will yield an expected cash flow C, and its return has systematic risk β , where:

$$\beta = \text{cov}(R, R_m) / \text{var}(R_m) \quad (1)$$

The project is to be all-equity financed. By the CAPM, the required return on the project is:

$$R = r_f + \beta (R_m - r_f) \quad (2)$$

R_m is the expected return on the market, and r_f the risk-free rate. (7). Relation (2) can be reexpressed in value form:

$$V = (C - q \text{cov}(C, C_m)) / r_f \quad (3)$$

C_m is the expected cash flow of the market portfolio and q is the market risk premium in value terms, namely

$$q = (C_m - r_f V_m) / \text{var}(C_m)$$

where V_m is the value of the market portfolio. /8/

Whether the project is accepted or not depends on whether

$V \geq I$. Now a commission rules that the return on the project

The conclusions of (7) and (8) can be combined if we assume that firms only consider projects of the same riskiness as their preexisting assets. This assumption is not extremely unrealistic in the case of public utilities at large. The assumption made in the beginning of this part must be reiterated. Namely that regulation does not affect the risk of assets.

We can now form a positive hypothesis:

$$\beta_j = a_0 + a_1 r_f + a_2 \beta_j + e \quad (10)$$

where β_j is the book return allowed to equity of firm j

r_f is the risk free rate

β_j is the beta of the firm j

e is a random error term fulfilling the normal regression assumptions.

The hypothesis is testable as a regression /10/. Proper ex-ante regulation would require:

1. $a_0 = 0$; If not commissions are giving investors benefits or losses unwarranted by opportunity cost considerations. /11/

2. $a_1 = 1$ and $a_2 = R_m - r_f$; both equalities are necessary. It must be noted that $(R_m - r_f)$ denotes the expected risk premium on the market. If the commissions act as hypothesized they should use their best estimates for this magnitude. There is no a priori reason to believe that such estimates are changed or reversed more often than markets trends change or are reversed. Thus testing the model separately for 1959-65 and 1966-69, we roughly expect stability of the coefficient a_2 within each subperiod.

The regression runs gave the following results:

TABLE I

	a_0	a_1	a_2	R^2
<u>59-65</u>	6.98	0.71 ³	-0.32	0.059
s.e.	1.55	0.42	0.86	
t	4.49	1.70	-0.37	
 <u>66-69</u>	 1.29	 1.26	 1.69	 0.348
s.e.	3.01	0.37	2.17	
t	0.43	3.42	0.78	

Notably, a_1 is in both cases within one s.e. of unity; it appears more significant in the second sub-period. On, the other hand, a_2 does not appear to vary significantly from zero. This implies that regulatory rates are not sensitive to variation in betas /12/. Since a_2 comes out to zero, we can interpret a_0 as some kind of average risk premium granted by regulators. In order to assess better the magnitude and stability of this term, the following regression was run over the entire period:

$$\rho_i = a_0 + a_1 r_i + a_2 d + u \quad (11)$$

where d is a dummy variable for the second subperiod. It must be noted that equation(11) has no company-specific independent variables. Only average effects can be deduced from it. The results were as follows:

TABLE II

	a_0	a_1	a_2	R^2
	5.97	0.96	-1.91	0.19
s.e	1.08	0.25	0.72	
t	5.55	3.80	-2.67	

It must be noted first that the fit of this equation is better than the previous one. The coefficient of the risk free rate is practically equal to unity and significant. The "average" risk premium is 5.97 in 1959-65 and 4.06 in 1966-69. The average beta in my utility sample is about 0.5 . If average realized risk premia on the whole market are any indication of the hypothesized estimates which commissions make, the risk premia granted to these utilities should be about 4.45 and 2.74 in the two subperiods respectively. On the basis of this very rough comparison we may very tentatively assert that regulatory rates on equity tend to overshoot opportunity costs. (As these costs are perceived by investors at the specific time). It is also noteworthy that the regression results indicate a drop in the average premium granted with comparable magnitude to the drop in ex-post risk premia on the utility sample. This does not imply necessarily that regulators take into consideration market expectations. The drop in the second period can be the result of the sharp rise in the interest rate of the period. If regulatory rates did not on average increase as sharply the

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coefficient of the dummy a_3 would necessarily appear negative.

The regulatory model hypothesized above rested on the assumption that regulators try to determine rates in an ex-ante fashion. I.e that their considerations are really oriented to the opportunity cost concept. This type of regulation would imply that once an ex-ante rate was determined the realized outcomes could diverge from this rate without this divergence being reason to change the ex-ante rate. In the simple form presented, the model rested on the presumption that the risk of the assets remains unchanged before and after regulatory decisions. It may be the case however that regulatory decisions are contingent on specific outcomes of a firm's returns. Such a procedure would focus not on the given stochastic characteristics of an asset but on realized values of its returns. If realized values are influenced so as to converge on some prior conception of a "fair return", the ex-ante risk of returns is thereby reduced. This "ex-post" type of regulatory intervention can lead us to formulate a new hypothesis.

The lack of sensitivity of allowed rates on the company's beta and the apparent fixed risk premium granted suggest that average utility returns are a relevant standard in commissions' decisions, if regulation is "ex-post". The realized returns of the firms under regulatory scrutiny will then be compared to some such standard. The comparable standing of the regulated firm's returns vis-a-vis the utility average must then influence the rates allowed. As a first test for this hypothesis, the following equation is formulated.



$$\rho_j = k_0 + k_1 r_1 + k_2 I_{pj} + k_3 I_{dj} + u_j \quad (12)$$

The independent variables are as follows:

r_1 is the rate on Baa bonds. The reason for the use of a long rate is that it reflects better the costs of long-term money and will thus capture expectational influences on ρ_j .

I_{pj} is a ratio measure. Its numerator equals the average price relative ex-dividend, for firm j over two years prior to regulation. The denominator represents the same variable for the S&P utility average over the same two year period.

I_{dj} is a ratio measure of relative dividend performance. Its numerator represents the average dividend yield of firm j over two years prior to regulation. The denominator represents the same variable for the S&P utility average over the same two years. This dividend yield index was separated out in order to test the possibility that regulators protect only dividends and not the whole return.

u_j is the usual regression error term.

This test amounts to a formulation of the comparable earnings rule if we assume that regulators do not recognize any differences in risk among public utilities. For purposes of this test the sample has been enlarged to include data from the period 1955-58. This was a period of relatively stable utility prices on average and the stability of the "standard of comparison" will lend strength to the test if the hypothesis is true. Due to this addition to the sample a dummy variable for rate base was also included to enhance the accuracy of the test. The value of 1 accompanied FV bases. Its coefficient is k_4 .



The crucial coefficients for this hypothesis are k_2 and k_3 . If the hypothesis is true they should come out with negative values. Such a result rests on an important assumption. Price relatives in the period prior to regulation embody investors' expectations. If the rate allowed is subject to anticipation a positive relation may appear between the dependent variable and I_{pj} . The numerator of this variable is the price relative of the specific firm. Its numerator is the more recent price of the firm's stock prior to regulation. If regulatory decisions are anticipated, then these anticipations will be most pronounced in that price. Anticipations may also influence the coefficient of the dividend term. The numerator of I_{dj} is the dividend yield of firm j . This yield has as denominator the stock price two years prior to regulatory scrutiny. If investors anticipations are formed two or more years in advance they would be embodied in that price thus tending to produce a negative k_3 . This result is however more far fetched than the possible effect on k_2 .

The hypothesis of equation (12) may thus lead to either acceptance of the operation of the rule of comparable earnings based on market variables; or it may indicate a mechanism of expectation formation. In the latter case however any evidence of the comparable rule will by definition have been obliterated. It must be noted that if both mechanisms are true, a circular game between regulators and investors could result. In anticipation of regulation proceedings investors may act to press prices downward thus worsening the comparative standing of the firm vis-a-vis the average. Regulators acting upon that may then grant higher rates. This double game should however result in

creating a tendency of k_2 towards negative values again unless regulators got wind of the game and granted lower rates, and so on.

The results of the test follow:

TABLE IV

	k_0	k_1	k_2	k_3	k_4
55-69	9.44	-0.13	2.65	-0.20	-2.18
t	5.63	-0.83	2.14	-0.35	-6.10
$R^2=0.31$					
55-58	-7.47	4.43	4.22	1.01	-1.35
t	-0.69	1.42	2.07	0.44	-1.25
$R^2=0.54$					
59-65	8.32	-0.03	2.96	-0.25	-2.58
t	3.78	-0.17	2.13	-0.38	-6.79
$R^2=0.42$					
66-69	3.71	11.05	1.59	-0.60	-2.43
t	0.85	2.17	0.41	-0.67	-3.08
$R^2=0.49$					

It is clear from the positive value of k_2 that we cannot find in these results corroboration of the comparable rule. The anticipation version of the hypothesis seems to come true with the exception of period 66-69. It is noteworthy that in these years of steep increases in the interest rate the



coefficient of r_1 is the only significant one among those which accompany variables that might embody expectations. Another noteworthy part of the results is the coefficient of the dummy variable. It appears stable in the two later subperiods as it had been previously determined. (cf p.3 above). In the period 1955-58 however it appears far lower. This implies that differential treatment of FV and BC bases was not as pronounced in that period, or that rate bases were not determined in the same fashion at that time.

Summary and Conclusions for Part I

Regulatory rates allowed on equity are not sensitive to the beta risk measure. If judged on an ex-ante basis they appear to include a fixed risk premium allowance which by some rough indications exceeds required risk premia. This is especially so if we consider allowed rates as marginal rates /13/. Consistent regulatory overallowances can only end up being a guarantee of growth in the values of regulated firms.

Regulatory practices viewed as an ex-post procedure which leads to convergence of realized returns onto ex-ante values have been tested in a form that corresponds to the comparable earnings rule. There is no verification of such practice. This lack of verification does not imply that such rules are not practiced. It implies that investors anticipate regulatory decisions and that consequently prices prior to regulation are not independent of the outcome of regulation. /14/

Part II: Allowed Rates and Accounting Variables

It is known that in a technical sense rates are formed on the basis of book value magnitudes /15/. Specifically the rule of comparable earnings involves normally comparisons of book rates of return. The purpose of this part is to formulate a simple version of this rule and test its validity. The rule itself involves of course an assessment of "comensurate risks". In a system of book values the natural choice of risk index is the debt book ratio.

In order to test a version of the rule it is desirable to isolate disturbances to the cross sectional stability of the accounting variables. I.e. it is necessary to try and isolate a sample in which the interest rate for example is stable, since we want to isolate the possible effects of accounting values. Thus the tests are limited to the period 1959-65 in which the interest rate was relatively stable. There are 127 cases in this subsample.

Let us suppose we have two firms which are judged by a Commission as having the same business risk. Then they should get the same overall rate on a book basis by the regulators assumed standards. This is the principle of comparable returns.

$$R_1 = R_2 = \rho \quad (1)$$

If firm 1 has no debt but firm2 has a debt-to-assets ratio d and pays a rate r_2 on its debt we have the respective returns to equity:

$$R_{e1} = R_1 = \rho \quad (2)$$

$$R_{e2} = \rho + (\rho - r_2)d/(1-d) \quad (3)$$

An assumption underlying (3) must be underlined here. The tax-deductibility of debt is not embodied in the formulation because it is asserted that commissions pass to the consumer tax benefits due to debt. This is presumably done by shifting around the level of before tax earnings of the firm. If X_0 is the overall cash flow of an all equity firm, the same firm with debt D and a rate of interest r would be allowed before tax cash flow X , where:

$$X = X_0 - rD(t/1-t) \quad (4)$$

and t is the rate of corporate tax/16/. This tax treatment is compatible with the comparable earnings rule.

We note from (3) that as long as $\rho > r_2$ there will also result $R_{e2} > R_{e1}$. If ρ is given for the assumed level of business risk, the equity firm 1 could attain exactly the same equity return as firm 2 if it borrowed to the same book level. Thus, equal risk as measured here would be compensated by equal return both overall and on equity.

Not all firms can borrow at the same rate however, Let us suppose that two firms have the same business risk and the same debt ratio. Their embedded cost rates differ being r_1 and r_2 respectively and $r_1 < r_2$. If they are allowed the same overall rate, equity returns will be:

$$R_{e1} = \rho + (\rho - r_1)d/(1-d)$$

$$R_{e2} = \rho + (\rho - r_2)d/(1-d)$$

and clearly $R_{e2} < R_{e1}$. This means that stockholders get unequal returns for equal risk. The comparable rule is violated at the equity level but upheld at the overall level. If both firms were



allowed the same equity return it would be overall rates that would differ : $R_1 < R_2$.

For a multiplicity of firms we can formalize the process of equity return equalization by positing that equity rates are set on the basis of 'average interest cost' as this latter is estimated by commissions. Namely that:

$$R_{e1} = \rho + (\rho - r) d_1 / (1 - d_1) \quad (5)$$

where ρ is the overall appropriate rate and r is the regulators' estimate of 'normal' or 'average' borrowing cost. It must be noted that if a process like (5) is in operation, the regulators are in fact fixing a book risk premium per unit of $d/(1-d)$. From (5) it follows that in this case the overall rate allowed will be:

$$R_1 = \rho + (r_1 - r) d_1 \quad (6)$$

This implies that R_1 varies about ρ in proportion to the variation of r_1 about r , the factor of proportionality being the debt ratio.

Let us now contrast briefly the implications of (6) to those of (1). In the context of varying embedded rates, equation (1) means that overall rates are equalized within a presumed class of business risk; and that hence equity rates are not. (6) means the opposite. An implication of the latter is that "savings" (dissavings) through less (more) than normal borrowing costs are passed on to the consumer. In the context of (1) these savings or dissavings are absorbed by equity owners. If the regulatory process were frictionless and (6) held stockholders would be indifferent to embedded borrowing rates since their returns (on book value) would be completely insulated from their variation. Given regulatory lag however, this is not true. By obtaining better rates after the rate decision

returns on book equity can be improved. If (1) holds stockholders lack insulation from borrowing costs.

In the case of public utilities there is also preferred stock. On the basis of equivalent reasoning we can extend equation (6) to include this type of fixed obligation also:

$$R_1 = \rho + (r_1 - r)d_1 + (s_1 - s)p_1 \quad (7)$$

Analogously to r , s is the 'normal' cost of preferred. s_1 is the embedded preferred rate and p_1 the book preferred ratio of firm 1.

In the testable form the variable $(A_1/10^4)$ was included for size of assets of firm 1. This was used on the presumption that the basic rate ρ might vary with size. /17/. the form to be tested now becomes:

$$R_1 = a_0 + a_1(A_1/10^4) + a_2(r_1 - r)d_1 + a_3(s_1 - s)p_1 + v_1 \quad (8)$$

The two alternative hypotheses are:

$$\text{I. } R_1 = \rho + e_1$$

$$\text{II. } R_1 = \rho + (r_1 - r)d_1 + (s_1 - s)p_1 + u_1$$

If (I) is true a_2 and a_3 will tend to zero. If (II) holds they will tend to 1.

There remains one problem with (8). Estimates of r and s must be devised. It must be remembered that these are borrowing costs considered 'normal' by commissions. They might correspond in fact to their subjective estimates which we have no way to measure. Thus it is necessary to discuss the effects of error in our estimates of these rates. For simplicity we can abstract from the preferred term for the moment. Let us suppose that the

true 'normal' rate is r' and that our estimate of it is r , where $r=r'+h$, $h>0$. Then the true relationship is:

$$R_1 = a_0 + \dots + a_2(r_1 - r')d_1 + u_1$$

This can be rewritten as :

$$R_1 = a_0 + \dots + a_2(r_1 - r')d_1 + a_2hd_1 + u_1 \quad (9)$$

If we run the regression with r the term a_2hd_1 in (9) will behave as an omitted variable. To the extent hd_1 is correlated with $(r_1 - r)$ the estimator of a_2 will be boosted. The remaining effect will boost the estimator of a_0 . When r' is underestimated we will have $h<0$ and effects will be the opposite. If of course (I) is the true hypothesis, $a_2=0$ and error in the estimate will leave a_0 unaffected. It is obvious from this analysis that underestimation of r' may produce results which will look as if generated by (I) even if (II) is the correct equation. To increase the discriminating power of the tests it is better to over- than to underestimate r' . Correlation estimates of r_1d_1 to d_1 and s_1p_1 to p_1 exceed 0.75. This indicates that the effect of omitted variables on a_2 and a_3 in equation (8) should be visible if (II) is true.

These findings suggest the following test methodology. Regression (8) will be fitted with successively higher pairs of values for r and s . If (II) is true each successive run must yield higher estimates of a_0 , a_2 and a_3 . If (I) is true such higher estimates will not materialize. Three pairs of values were used for r and s , as follows:

TABLE IV

	r	s	
Run 1	4.106	3.339	(sample means)
Run 2	4.300	4.000	
Run 3	5.000	5.000	

Note : The r used in Run 2 is the average rate on Baa bonds in the period 1959-65.

The following table shows the results of the three runs.

TABLE V

	a_0	a_1	a_2	a_3
<u>Run 1</u>	5.77	0.22×10^{-3}	0.17	0.43
t	115.7	0.38	2.10	2.01
$R^2 = 0.065$	F-statistic (3,123) = 2.86 *			
<u>Run 2</u>	5.80	0.20×10^{-3}	0.16	0.61
t	125.7	0.35	2.06	2.20
$R^2 = 0.074$	F-statistic (3,123) = 3.25 *			
<u>Run 3</u>	5.90	0.16×10^{-3}	0.15	0.72
t	112.5	0.27	1.80	2.01
$R^2 = 0.073$	F-statistic (3,123) = 3.21 *			

* indicates significance of F at the 95% level.

The first observation on these results is that the regressions explain only a small percentage of the variation in R_1 . This is not surprising considering that there are two kinds of cross-sectional 'noise' in the data, namely across companies as well as across regulatory commissions. /18/. Judging from F-statistics on the other hand, all regressions are significant. Moreover, the coefficients a_2 and a_3 are also significant. a_1 is never significantly different from zero and we can conclude that asset size is not relevant in explaining overall regulatory rates. The significance of a_2 and a_3 verifies the proposition that there is some shifting of financial cost deviation from 'normal' levels onto the consumer. On the whole, this implies a certain degree of insulation of the stockholder from past management decisions. In the sequence of runs with successively higher values of 'normal' financial rates, the constant a_0 and the preferred coefficient a_3 behave as predicted by hypothesis (II). The value of a_3 is lower than 1 in all cases, but judging from the results its true value probably exceeds .50. This evidence contributes a partial reason for the continued preference of public utilities to issues of preferred stock.

The debt coefficient a_2 is significant in all runs but it is closer to zero than to 1, and does not change through the successive runs in the direction predicted by (II). On the contrary it shows a slight tendency to decrease. This behavior does not contradict the core of hypothesis (II) because the values tried for r cannot be too different from presumed 'normal' levels.

The main question which arises from the results of Table V is the asymmetry which emerges between debt and preferred stock. The low value of a_2 compared to a_3 , and the slight tendency of a_2 to decrease in successive runs indicates that in comparison to preferred stock there are some negative influences on R_1 associated with debt. It is highly probable that the differential appearance of the role of debt is connected to its special tax treatment. The possibility exists that tax-benefits arising from debt are not as completely shifted to the consumer as assumed in our hypotheses. In this case however our specifications would underestimate the role of debt in comparison to preferred, and the results should point at a value of a_2 higher than a_1 .

A possible source of such negative effect as appears can be the consideration by commissions of the real (as opposed to accounting) effect of the tax deductibility of debt on the overall risk of the firm. The well known MM proposition on the value of the firm in the presence of corporate tax yields a cost of capital which is a decreasing function of debt:

$$k = k_0 - t(k_0 - i)D/v$$

where k_0 is the cost of capital for an all-equity firm; t is the corporate tax rate, i is the cost of debt; and D/v is the market value debt ratio. It has been shown that even if regulators shift the tax benefit of debt, deductibility of interest will still exercise a risk-reducing effect on the overall returns of the firm /19/. If regulators realize that



effect and try to compensate for it, then our regression equation (8) is misspecified. A second term involving debt has been omitted. In order to have a notion of the entire effect of the debt ratio the same regression was run with one change. The term $(r_1 - r)d_1$ was substituted by d_1 . The coefficient of the preferred term did not change and the coefficient of d_1 came out significant and equal to -0.36. If the true specification involves a term like the one on the rhs of (10), a value for k_0 would be implied equal to 5.74. This value is not unrealistic. (Note that this is only rough speculation since the book debt ratio is only a proxy for the market value ratio).

Considerations of risk as an input to regulatory decisions cannot really be detected within the framework of book value variables. The negative effects detected while testing the comparable earnings rule are an indication but not an explanation. At any rate they are not consistent with the operation of this rule on the basis of book values.

Summary and Conclusions for Part II

There is only partial evidence that the rule of comparable earnings is consistently practiced by regulators. Deviations of embedded preferred costs from 'normal' levels are apparently shifted to the consumer to a significant extent. Deviations of embedded debt costs are not significantly shifted. There is evidence that debt gives rise to negative effects upon the regulatory rate allowed. It is possible they are connected to risk considerations entering the decision process of regulators.

NOTES

- . These are determinations found in the Supreme Court decision on FPC v. Hope Natural Gas Co., 320 US 591 (1949)
- . See S.C. Myers, 'The application of finance theory to public utility rate cases' in the Bell Journal of Economics and Management Science, Spring 1972; especially section 7.
- . A series of assumptions are necessary to systematize the relationship between book and real returns of a single firm overtime. For an interesting exercise see T.R. Stauffer, 'Measuring Rates of Return' in the Bell Journal..., Autumn 1971
- . The source of the data on allowed rates and rate bases is the report put out by A. Andersen and Co., 'Returns Allowed on Public Utility Rate Cases', vols. II, III
- . This practice is specifically used by the FPC.
- . This corresponds to the evidence in the data whenever BC rate bases are available.
- . This necessity arises in order to convert overall rates to equity rates. Also in Part II where the book value of the debt and preferred ratios are extensively used.
- . For a complete exposition of the CAPM see Sharpe: Portfolio Theory and Capital Markets.
- . See R.S. Hamada, 'Portfolio analysis, market equilibrium and Corporation finance' in the Journal of Finance, March 1969
- . Only 57 cases of firms listed on the NYSE are included here. The beta has been estimated for each over the ten-year period prior to the year of regulation. Monthly observations were used in the estimation.
- . Considerations of regulatory lag are assumed away in this simplified approach.
- . Cross-sectional variation in beta is significant.
- . For estimates of marginal rates see R. Litzenger and C. Rao, 'Estimates of the marginal rate of time preference and average risk aversion of investors in electric utility shares, 1960-66', in the Bell Journal..., Spring 1971. They find an average of about 5.6% ; equity rates allowed in the period 1959-65 in my sample average at about 9%.
- . This result lends itself to extensive testing for the presence of systematic effects on the price of regulated stocks in the pre-hearing period in comparison to non-regulated ones.

6. Cf. above Introduction, pp. 1,8.
6. See H. Gordon, 'Some estimates of the cost of capital to the electric utility industry, 1954-57; Comment', AER, Dec. 1967.
7. There is precedent for this assumption in H. Miller and F. Modigliani, 'Some estimates of the cost of capital in the electric utility industry, 1954-57' in AER, June 1966.
8. The data cover decisions of over 20 regulatory agencies.
9. See E.J. Elton and M.J. Gruber, 'Valuation and the cost of capital in Regulated industries', Journal of Finance, June 1971.

10. Doctoral candidate at the Sloan School of Management.

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Date Due

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FEB 10 '78

MAR 11 '78

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MAY 12 '78

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AUG 4 1979

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